Identification Guide to Montane Amphibians of the Southern Rocky Mountains

Lauren J. Livo

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Introduction

This guide is intended for field personnel surveying montane amphibian populations in the southern Rocky Mountains, especially in Colorado. It contains three main sections:

- Keys to montane amphibians (page 1)
- Detailed species descriptions (page 5)
- Recommended field procedures (page 21)

Montane amphibians are considered to be those that occur at elevations above 8,000 feet (2440 meters) in Colorado, Wyoming, and northern New Mexico. A few species described in this booklet are restricted to high elevations, while other species also occur at low elevation sites.

The maps included with species accounts show the approximate distribution for the eight montane species described in this booklet. The maps are redrawn from regional field guides and other sources.

Keys to montane amphibians

This section contains keys for the montane amphibians of the southern Rocky Mountains. There is one key for each of the three life stages of amphibians:

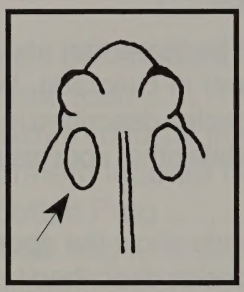
- Metamorphosed amphibians; see page 2
- Larval amphibians (salamanders with gills and anuran tadpoles); see page 3
- Amphibian eggs; see page 4

To use a key, begin with the first pair of statements and select the statement that matches your specimen. After each statement is either the number of another statement or the name of an amphibian. If the statement concludes with a number, go to the indicated pair of statements. When the statement concludes with the name of an amphibian, turn to the species account to confirm your identification.

Key to metamorphosed amphibians

1a. Salamanders, metamorphosed amphibian with long tail . . . 2
1b. Frogs and toads, metamorphosed individuals lacking tail . . . 3

2a. Stout body, widespread . . . *Ambystoma tigrinum* (page 18)
2b. Slender body, limited to north-central New Mexico . . . *Plethodon neomexicanus* (page 20)



Parotoid gland

Dorsolateral fold

3a. Prominent parotoid glands behind eyes; skin dark brown and covered with conspicuous warts . . . *Bufo boreas* (page 6)
3b. No parotoid glands . . . 4

4a. Brown skin has dark spots with indistinct edges; dorsolateral fold present but may not be conspicuous; Wyoming only . . . *Rana luteiventris* (page 12)
4b. Skin not as above . . . 5

5a. Conspicuous dorsolateral folds on back . . . 6
5b. No dorsolateral folds . . . 7

6a. Conspicuous dark "mask" from snout to angle of jaw, *Rana sylvatica* (page 14)
6b. Dorsal color brown or green with a pattern of large dark spots . . . *Rana pipiens* (page 10)

7a. Body size small, <1.5 inches (38mm); usually three stripes on back . . . *Pseudacris triseriata* (page 8)
7b. Body size large, 1.75-6 inches (44-152mm); back green to olive without stripes . . . *Rana catesbeiana* (page 16)

Key to larval amphibians

(This key does not include *Plethodon neomexicanus* because this species does not have aquatic larvae.)

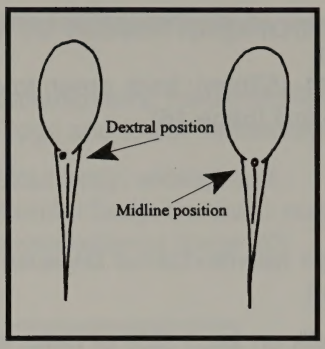
1a. Larvae with three conspicuous gills on each side of head; body slender and long . . . *Ambystoma tigrinum* (page 18)
1b. Larvae a tadpole, not as above . . . 2

2a. Tadpoles jet black, often in large aggregations; vent at midline of venter . . . *Bufo boreas* (page 6)
2b. Tadpoles may be dark, but not pure black; vent on right side of venter . . . 3

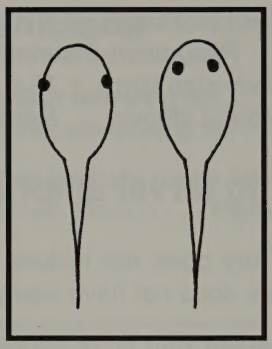
3a. Eyes of tadpole at margin of body outline . . . *Pseudacris triseriata* (page 8)
3b. Eyes within margin of body outline . . . 4

4a. Tadpoles olive green with black spots above, white below . . . *Rana catesbeiana* (page 16)
4b. Tadpoles not as above . . . 5

5a. Long tail (total length/body length≥2.6); dark above with flecks of gold; tail with small blotches; Wyoming only . . . *Rana luteiventris* (page 12)
5b. Tadpole not as above . . . 6

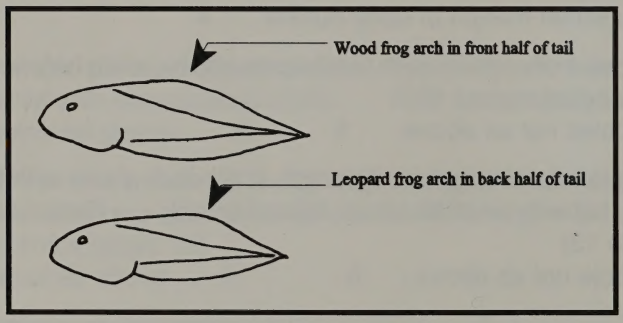


Vent position



Position of eyes

6a. Tadpoles metallic bronze or pinkish on sides; tail fin with arch in front half of tail . . . *Rana sylvatica* (page 14)
6b. Tadpoles gray, brown, or olive; tail fin arch in back half of tail . . . *Rana pipiens* (page 10)



Key to amphibian eggs

1a. Eggs deposited in terrestrial situations; north-central New Mexico only . . . *Plethodon neomexicanus* (page 20)
1b. Eggs deposited in water . . . 2

2a. Eggs deposited in long strands (strands can be difficult to see in compact masses) . . . *Bufo boreas* (page 6)
2b. Eggs not as above . . . 3

3a. Eggs deposited in large oval or spherical mass, usually attached to aquatic vegetation . . . 4
3b. Eggs not as above . . . 5

4a. Mass 2-5 inches (5-13cm) in diameter; averages 3000 eggs (range 650-6250 eggs) per mass; vitellus size about 1.7mm (range 1.3-2.2mm) . . . *Rana pipiens* (page 10)
4b. Mass 2.5-6 inches (6-15cm) in diameter; averages 850 eggs (range 700-1250 eggs); vitellus size about 1.9mm (1.8-2.4mm) . . . *Rana sylvatica* (page 14)

5a. Eggs deposited as surface film or floating disk . . . 6
5b. Eggs not as above, deposited in small clusters or singly . . . 7

6a. Eggs deposited as single-layer surface film; large >1 foot (30cm) diameter . . . *Rana catesbeiana* (page 16)
6b. Eggs deposited as dense (multi-layer) surface film or disk 4.7-7.8 inches (12-20cm) in diameter; usually not attached to vegetation; Wyoming only . . . *Rana luteiventris* (page 12)

7a. Eggs deposited in linear cluster 1 to 2 inches long, usually containing 30 or more eggs . . . *Pseudacris triseriata* (page 8)
7b. Eggs deposited singly or in small clusters of up to 20 eggs on aquatic vegetation; clusters surrounded by gelatinous envelope . . . *Ambystoma tigrinum* (page 18)

Species descriptions

The following pages contain detailed descriptions of each amphibian species that occurs above 8,000 feet (2440m) elevation in the southern Rocky Mountains.

Larval descriptions include details about oral disk characteristics; these details are best examined using a hand lens.

Boreal toad (*Bufo boreas boreas*)

Adult boreal toad

Adult description

Snout-vent lengths of metamorphosed individuals range to about 3.7 inches (95mm). Newly metamorphosed individuals range in size from about 0.6-1.0 inches (15-25mm).

Skin dark brown and covered with prominent warts, including large parotoid glands behind eyes (no cranial crests). Light mid-dorsal stripe from snout to groin (may be absent in newly metamorphosed toads). Also called the western toad.

Sex differences

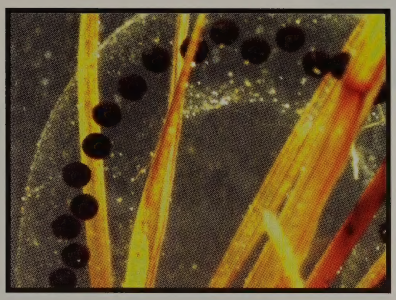
Males have a brown callus on the top of the thumb; handling elicits "chirping" sound from males. Females reach larger body sizes.

Forefoot of male boreal toad, showing brown thumb callus

Eggs

Eggs jet black and deposited in long strands. Occasionally, strands can be difficult to see when the clutch is deposited in a small, compact area. Egg deposition sites are most often along sunny north or west edges of pools in shallow water, although clutches can be distributed throughout small sunny pools or puddles.

Boreal toad egg mass



Closeup of strand of eggs

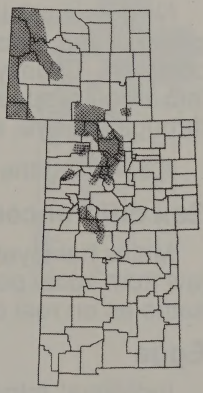
Larvae

Boreal toad tadpoles are completely black. The vent is located on the midline of the body. Boreal toad tadpoles frequently crowd together in shallow water and swim actively during the day. Large larvae may reach total lengths of 2.0-2.4 inches (50-60mm) and show indications of the middorsal stripe. Labial tooth rows usually 2/3.

Boreal toad tadpole

Habitat and phenology

Boreal toads occupy a variety of wetland habitats, including pond margins, willow karrs, wet meadows, and riparian areas. They usually occur at elevations between 8,000 and 11,940 feet (2440-3640m).



Breeding occurs after ice melts from the pond, usually between mid-May and early June but as late as July at high elevations. Males do not have a conspicuous breeding call, but may produce soft chirps, usually when disturbed by another toad. Eggs hatch in about 2 weeks. Larvae metamorphose from late July through early September.

Legal Status

Boreal toads are listed as Endangered in Colorado and New Mexico and as a protected species in Wyoming. They are listed as a Candidate species by the U.S. Fish and Wildlife Service.

Western chorus frog (*Pseudacris triseriata*)

Adult western chorus frogs (green and brown morphs)

Adult description

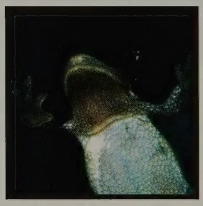
Adult size small, to 1.5 inches (36.9mm). Average snout-vent length of adults from 5,000 feet (1524m) elevation is about 0.9 inches (24mm), compared to about 1.3 inches (34mm) for adults from 10,350 feet (3155m) elevation. Newly metamorphosed individuals may have snout-vent lengths of about 0.5 inches (13mm).

No dorsolateral folds. Dorsal color brown, green or red, with brown, green or red stripes or spots. Brown most common color, red least common. Usually three stripes on back; these can be solid or broken into irregular spots. On each side a dark stripe extends from the snout, through the eye, and along the side to the groin.

Also called the striped chorus frog.

Sex differences

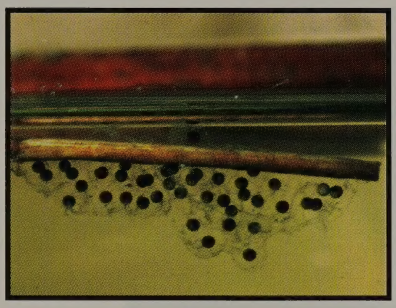
Males have yellowish and wrinkled skin under jaw from vocal pouch; skin under jaw of females same as on rest of ventral surface.



Throat of male chorus frog

Eggs

Individual females produce about 450 eggs, which they deposit in small clusters 1-2 inches (25-50mm) long attached to aquatic vegetation or twigs in shallow water. Each cluster can contain 30 or more eggs.



Egg mass of western chorus frog

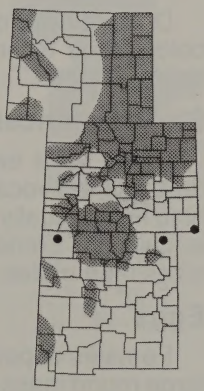
Tadpole of western chorus frog

Larvae

Tadpoles are to 1.5 inches (38mm) total length and dark brown or gray. When viewed from above, the eyes are at the margin of the body. Ventral surface silvery. Vent located on lower right side of body near tail fin. Chorus frog tadpoles do not normally form dense aggregations. Individual tadpoles may swim into substrate or aquatic vegetation. Oral disk not indented, one row of marginal papilla.

Habitat and phenology

Chorus frogs occupy marshes, ponds, and wet meadows up to about 12,000 feet (3660m) elevation. In the mountains, adults tend to be diurnal after the breeding season.



During the breeding season, males produce calls that individually sound like a finger running along the teeth of a comb. At the height of the breeding season calling can occur day or night; large breeding aggregations can be heard from considerable distances. Depending on elevation, choruses can be heard from late March through June. Populations on the plains can be finished with breeding well before breeding in high elevation populations is underway. Occasionally, isolated males can be heard calling in July or August. Adults can be difficult to locate visually. At low elevations, chorus frogs may metamorphose by June; in the mountains metamorphosis occurs in July and August.

Northern leopard frog *(Rana pipiens)*

Adult northern leopard frog

Adult description

Snout-vent lengths of adults range to about 4.4 inches (111mm). Newly metamorphosed frogs are about 1.2 inches (30mm) long.

Dorsolateral folds extend from behind eye to groin. Background color green or brown. Conspicuous dark spots on back with well-defined edges.

Sex differences

Males have swollen thumbs on forefeet. Paired vocal pouches at sides behind head usually not visible unless male is calling. Females attain larger body sizes than males.

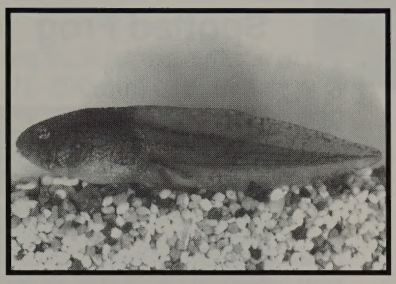
Forefeet of male northern leopard frog

Eggs

Females deposit their eggs in a single large round mass, 2-5 inches (5-13cm) in diameter, usually attached to aquatic vegetation. Each egg mass contains an average of 3000 (range 650-6250) eggs; larger egg masses also contain larger eggs. Several females may deposit their eggs in a relatively small area of a breeding pond. Egg deposition sites usually sunny and 5-7 inches (13-18cm) deep.

Forefeet of female northern leopard frog

Egg masses of northern leopard frog

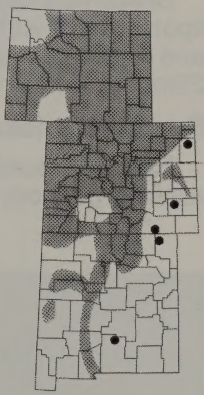


Northern leopard frog tadpole (Photo courtesy of Norman Scott, Jr.)

Larvae

Tadpoles are brown, olive, or gray above and white below. Vent located on lower right side of body near tail fin. When viewed from above, eyes are within the outline of the body. Leopard frog tadpoles reach total lengths of 3.4 inches (87mm). Anterior labial teeth rows <4; 2-3 rows posterior labial teeth; oral disk indented at sides.

Habitat and phenology



Northern leopard frogs range to about 11,000 feet (3353m) elevation in southern Colorado. In northern Colorado, however, they seldom occur above 9,500 feet (2,900m) elevation. They usually are found in habitats near permanent water, including the margins of ponds and lakes, streams, and in marshes.

Breeding occurs soon after the ice melts from ponds, about May or early June at higher elevations. The male breeding calls include an assortment of grunts, croaks, and snores. The eggs hatch in 4-15 days, depending on water temperature. Metamorphosis occurs in late summer; northern leopard frogs do not overwinter as larvae.

Spotted Frog *(Rana luteiventris)*

Adult spotted frog

Adult description

Snout-vent length to 2.8 inches (70mm). Brown with irregular black spots; ventral surface reddish. Dorsolateral folds. Indistinct tympanum and relatively warty skin. Size at metamorphosis 0.6-0.9 inches (16-23mm).

Sex differences

Enlarged thumb on male (see illustration for *Rana pipiens*). Females attain larger body size than males.

Egg masses of spotted frog (Photo courtesy of Stephen Corn)

Spotted frog tadpole (Photo courtesy of Charles R. Peterson)

Eggs

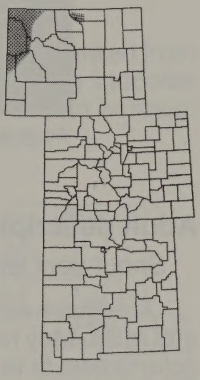
Egg mass forms a dense film many layers thick on the surface of the water. The mass measures 3-8 inches (75-200mm) in diameter and typically contains 500-600 (range 150-2000) eggs. Over time, the egg mass usually develops a greenish color due to the presence of a symbiotic algae.

Larvae

Tadpoles dark above with gold flecks. Venter bronze. Tail long (total length/body length ≥2.6) and with small flecks or blotches. Spotted frog tadpoles reach total lengths of 3 inches (75mm). Labial tooth rows usually 2/3; oral disk indented at sides.

Habitat and phenology

Occupies old oxbow ponds, ponds, marshes, and streams in foothill and montane areas of northwestern Wyoming as far south as northern Lincoln County; also occurs in the Big Horn Mountains at elevations between 6575 and 8365 feet (2000-2550m).



Legal Status

Spotted frogs are listed as a protected species in Wyoming as a Candidate species by the U.S. Fish and Wildlife Service.

Wood frog *(Rana sylvatica)*

Adult wood frog

Adult description

Snout-vent lengths of adults range to about 3.3 inches (83mm).

Dark mask extends from snout to angle of jaw. Prominent dorsolateral folds. May have light middorsal stripe from snout to groin. Ground color brown or tan. Colorado wood frogs were previously described as *R. maslini*.

Sex differences

Swollen thumb on forefeet of male (see illustration for *Rana pipiens*). Paired vocal pouches on side behind head usually not visible unless male is calling. Females reach larger body sizes.

Eggs

Females deposit egg masses 2½-6 inches (6-15cm) in diameter on aquatic vegetation; clutches average 850 eggs (range 700-1250 eggs). In Colorado each egg mass probably represents the entire clutch from a single female, although elsewhere there is evidence that females may sometimes deposit their eggs in two or more masses. Egg deposition sites are usually in shallow water 4-6 inches (10-15cm) deep and 3-10 feet (1-3m) from shore. Egg masses from numerous females are often clustered in a very small area of the pond, typically along a sunny north shore.

Larvae

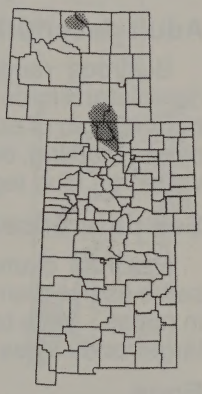
Tadpoles are brown or gray above with a bronze sheen on the sides and a pink sheen on the light-colored venter. Vent located on lower right

Wood frog by egg mass (Photo courtesy of Steven Aird)

Wood frog tadpole

side of body near tail fin. Tail not mottled or spotted. When viewed from above, eyes are within the outline of the body. Wood frog tadpoles reach total lengths of 2 inches (50mm). Anterior labial teeth in ≥4 rows; 4 rows posterior labial teeth; oral disk indented at sides.

Habitats and phenology



Wood frogs occur between 7,875 and 10,200 feet (2,400-3,115m) elevation in north-central Colorado, southern Wyoming, and the Big Horn Mountains of northern Wyoming. They inhabit wet meadows, pond and lake margins, and other wetland habitats.

Wood frogs breeding sites are usually glacial kettle ponds, although they sometimes use beaver ponds or manmade ponds. Breeding ponds typically are surrounded by coniferous forests. As soon as the ice is off the breeding ponds, usually in May, males arrive and begin calling, producing soft, ducklike calls. Females deposit their eggs during a period of 1-2 weeks. The eggs require 18-20 days to hatch. Metamorphosis occurs in mid-July to late August, about 75-85 days after the eggs were laid.

Legal Status

Wood frogs are listed as a species of special concern in Colorado and as a protected species in Wyoming.

Bullfrog *(Rana catesbeiana)*

Adult bullfrog

Adult description

Bullfrogs range from 3.4-8 inches (87-200mm) in length. No dorsolateral folds. Ridge of skin wraps from rear of eye around top and back margin of eardrum. Ground color bright green to dark olive, with darker mottling, depending in part on temperature. Darker bars may be visible on hind legs.

Sex differences

Eardrum diameter larger than eye diameter in males, about the same as eye diameter in females. Area under jaw can be bright yellow in males. Male bullfrogs can produce a variety of calls. Males attain larger body sizes than females.

Eggs

A newly deposited bullfrog egg mass forms a large film of eggs, a single layer thick, on the surface of the water. This film is typically 1-5 feet (30-150cm) in diameter and may contain as many as 20,000 eggs. After a short time, the eggs may sink beneath the water's surface.

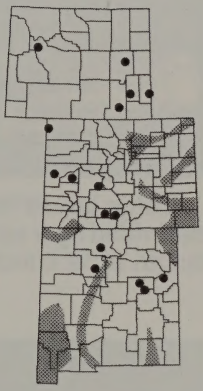
Larvae

Tadpoles are olive with dark spots above, white or cream below. Vent located on lower right side of body near tail fin. When viewed from above, eyes are within the outline of the body. Bullfrog tadpoles reach total lengths of 6.4 inches (162mm). Labial tooth rows usually 2/3 or 3/3; oral disk indented at sides.

Bullfrog egg mass (Photo courtesy of Tom R. Johnson)

Bullfrog tadpole

Habitats and phenology



Bullfrogs are not native to Colorado, Wyoming, or New Mexico. In Colorado, they have been introduced to at least 28 counties. Most populations occur at low elevations, but at least one population occurs at 9,000 feet (2740m) elevation along Hot Spring Creek in Gunnison County, Colorado.

Male bullfrogs have an extended calling season from late May through August. They produce a variety of deep calls. Bullfrogs breed in ponds, lakes, and other areas with deep, quiet water. Egg deposition dates in our area have not been studied, although several desiccated egg masses were observed on floating algae mats in early August at one low-elevation site. Larvae probably overwinter at least once before metamorphosis.

Tiger salamander *(Ambystoma tigrinum)*

Adult tiger salamander (Gilpin Co., CO)

Adult description

Total length of metamorphosed individuals averages about 7.5 inches (190mm), with a range of 2.6-8.9 inches (65-225mm). Color of metamorphosed individuals highly variable; may be mottled, spotted, or nearly uniform.

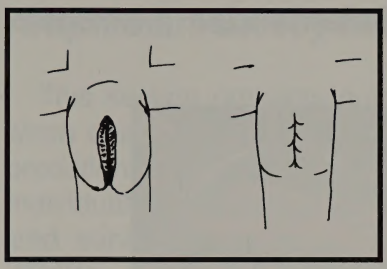
Large larvae may be sexually mature (paedomorphic); the largest described tiger salamander was a paedomorphic specimen with a total length of 12.6 inches (320mm).

Adult tiger salamander (Huerfano Co., CO

Adult tiger salamander (Baca Co., CO)

Sex differences

Vent of breeding males is swollen. When examined with hand lens, males have villi inside the vent while females have smooth folds.



Male (left) and female (right) vents

Eggs

Eggs deposited singly or in small clusters. Clusters usually contain fewer than 20 eggs. Cream or tan eggs usually attached to submerged vegetation in shallow water.

Larvae

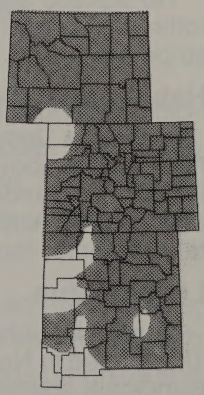
Larvae tan or olive and have 4 legs from an early stage of development. Larvae sometimes paedomorphic (sexually mature) and cannibalistic.

Tiger salamander egg mass (Photo courtesy of Stephen Corn)

Larval tiger salamander

Habitat and phenology

Metamorphosed salamanders are primarily terrestrial and nocturnal. They occupy a wide variety of habitats from low elevations to 12,000 feet (3660m). Adults migrate to breeding ponds after the ice melts. At a given pond, tiger salamanders usually have a relatively short breeding season. The presence of multiple larval size classes in a pond can result by two episodes of egg laying or by overwintering by the larger size class. Throughout the range of this species, however, egg laying can occur any time between mid-March and August. Depending on temperature, eggs hatch in 2-5 weeks.



Newly metamorphosed salamanders can often be found under downed logs, rocks, and other surface objects near the pond's edge.

Jemez Mountains Salamander *(Plethodon neomexicanus)*

Adult Jemez Mountains salamander

Adult description

Total length of adults to 2.6 inches (65mm). Color brown above. Long, slender body with short limbs and 18 or 19 costal grooves.

Sex differences

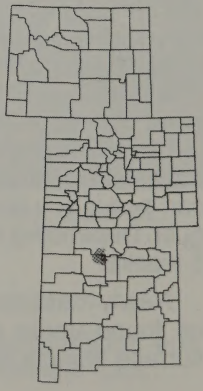
Vent of breeding males is swollen. When examined with hand lens, males have villi inside the vent while females have smooth folds (see illustration for tiger salamander).

Eggs and larvae

No aquatic stage for eggs or young. Eggs are deposited within rotting logs and in other terrestrial situations. Young have a faint dorsal stripe.

Habitat and phenology

Found in Jemez Mountains of north-central New Mexico above 7,000 feet (2130m) elevation; known from Sandoval, Rio Arriba, and Los Alamos counties. Primarily found in rotting logs and under talus on north-facing slopes.



Legal status

Jemez Mountains salamanders are listed as Threatened in New Mexico. They are listed as a Candidate species by the U.S. Fish and Wildlife Service.

Amphibian survey field procedures

This section presents guidelines for field personnel to use when dealing with observations of dead or dying amphibians, predation, and egg/tadpole "rescue" decisions for boreal toads. Individuals conducting amphibian surveys should use standardized survey forms, available from the Colorado Division of Wildlife.

General procedures

Observations

When at sites with amphibians (metamorphosed or larval), field personnel should check for any developmental and/or behavioral abnormalities that might be present in eggs, larvae, and metamorphosed amphibians. For example, normal boreal toad tadpoles actively swim, often in groups, in shallow portions of breeding pools. Abnormal behavior includes boreal toad tadpoles burrowing into the substrate or lying still for long periods of time during the day.

Disinfecting

If you observe dead or sick amphibians, disinfect your waders/boots before going into a different drainage (or moving more than 5 miles within a drainage). Rinse boots with a mixture of 2 tablespoons of chlorine bleach per quart of water.

Handling

Minimize handling of amphibians. Catch and touch amphibians only if there is a clearly important reason to do so. If you have contaminants on your hands (such as sunscreen, insect repellent, or lotion) protect amphibians you handle by using disposable gloves.

Use disposable gloves for handling sick or dead amphibians; change gloves after handling animals. After you visit a site with toads or other amphibians, always wash your hands before going to another site.

Procedures for dead or dying amphibians

If you observe dead or dying amphibians, contact the Colorado Division of Wildlife as soon as possible at one of the following phone numbers to report your observations.

Mark Jones (DOW, Ft. Collins) 970-472-4361
Chuck Loeffler (DOW, Denver) 303-291-7451 or 719-481-1902

If you have legal authorization - such as a scientific collection permit - and appropriate equipment and materials to collect dead or sick amphibians from the wild, observe the following procedures to collect specimens and relay them to the Colorado Division of Wildlife as soon as possible.

While in the field, collect specimens for lab tests. Fixatives can be either Bouin's or 10% formalin (1 part commercial formaldehyde mixed with 9 parts water). Containers used for amphibian collection and transport should be whirl packs or heavy mil plastic bags.

Dead animals

- Put each dead animal in a separate plastic bag. Label each bag with the following information: date, time, location, species, clinical signs, collector.
- Put fixative in half the specimen bags. Put the other specimen bags on ice or freeze as soon as possible.

Sick animals

- Aquatic stages (eggs, tadpoles, larvae): place in container with equal parts water and air. Put on ice as soon as possible.
- Terrestrial stages (metamorphosed anurans or salamanders): Place in container and put on ice as soon as possible.

Dead eggs

- Collect approximately 100 eggs from the egg mass. Freeze ½ and put ½ in a formalin solution.

Search the area for other dead or dying vertebrates (simultaneous dieoff of fish, birds, etc. could indicate the presence of a toxic chemical).

Record as much of the following data at dieoff sites as possible: date, time of day, location, observers, estimated time when deaths began, water quality characteristics, condition and numbers of each species and life-stage at site, written summary of physical examination of each affected animal, weather conditions (temperature, cloud cover, precipitation, wind speed and direction); note conditions for previous day if available, names of persons notified (with dates and times), and photograph the animal(s) if possible.

Predator control for boreal toads

If you observe unusual predation, such as flocks of ravens or other corvids devouring newly metamorphosed toads, document the occurrence as much as possible (time and date, locality information, written summary of species involved, photos, conditions at the time of observation) and contact Mark Jones with the information. If aquatic insect larvae are preying on eggs or tadpoles, remove the insects and put them in a container to bring to Mark Jones for identification.

If you observe predation by tiger salamanders or garter snakes, document the predation and if practical, remove the offending predator.

Boreal toad egg and tadpole rescue

If possible, contact Mark Jones or Chuck Loeffler before moving toad tadpoles or eggs. If, however, you observe egg masses or tadpoles in a pool that is drying and don't have time to contact one of these people, you can transfer the tadpoles or eggs to a more

stable pool if one is nearby (within walking distance). Scoop the eggs or tadpoles into a container (such as a cup or bucket) and transfer them in the container's water. If the temperatures of the two pools differ, temper the container before releasing the eggs or tadpoles. Deposit eggs in a sheltered portion of a north or west shore. Do not move eggs or tadpoles long distances.

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